

THE ASSOCIATION BETWEEN EXPOSURE TO PARTICULATE MATTER DURING PREGNANCY AND BIRTH WEIGHT AND GESTATIONAL AGE: THE UK PAMPER STUDY

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Background and Aims: Exposure to particulate matter during pregnancy is associated with adverse birth outcomes, but the evidence for some outcomes is inconsistent. The UK Particulate Matter and Perinatal Events Research (PAMPER) study investigated associations between maternal exposure to black smoke (BS) and birth outcomes in Newcastle upon Tyne, an industrial city with stable population, over three decades (1962-1992).

Methods: A two-stage statistical exposure modeling strategy was used, incorporating monitored weekly BS levels and temporally and spatially varying covariates, to estimate weekly BS exposure for each individual pregnancy (88,679 births with complete covariate information) averaged over each trimester and the whole pregnancy period. Regression analyses assessed associations between BS exposure and birth weight, gestational age and birth weight standardized for gestational age and sex.

Results: The median weekly BS exposure estimate across whole pregnancy was $33.8 \mu\text{g}/\text{m}^3$ (IQR 17.2 - $108.3 \mu\text{g}/\text{m}^3$). The unadjusted linear decrease in birth weight was 3.4g (95% CI 2.9 , 3.9) per $10 \mu\text{g}/\text{m}^3$ increase in BS, reducing to 1.7g (95% CI 0.9 , 2.4) after adjustment. The exposure-response function was non-linear: birth weight decreased by 70g for an approximately $100 \mu\text{g}/\text{m}^3$ increase in BS from the 1st to 75th percentile, with only 25g decrease for $100 \mu\text{g}/\text{m}^3$ BS increase from the 75th to 95th percentile. Standardized birth weight also reduced with an increase in BS exposure. Associations between BS and gestational age were very small and non-significant. Significant interaction between BS and deprivation on the effect on birth weight and standardized birth weight was observed.

Conclusions: Associations between maternal BS exposure and offspring birth weight were of the same order of magnitude as those reported for passive smoking, and varied across the range of exposure estimates. Based on our findings, we hypothesize that intrauterine growth restriction may be on the causal pathway in the association between exposure to BS and birth weight reduction.